Chapter 4

Revenue

Total revenue

✚ Total revenue (TR) is the amount of money a firm receives. If everybody pays the same price, the formula is: price multiplied by quantity sold (P × Q). For example, if I sell 200 doughnuts for 50p each, my total revenue is £100.

Maximum revenue, or revenue maximisation, is the output at which total revenue is at a maximum.

✚ When we plot the TR curve, we must consider whether the firm is a price taker or a price maker.

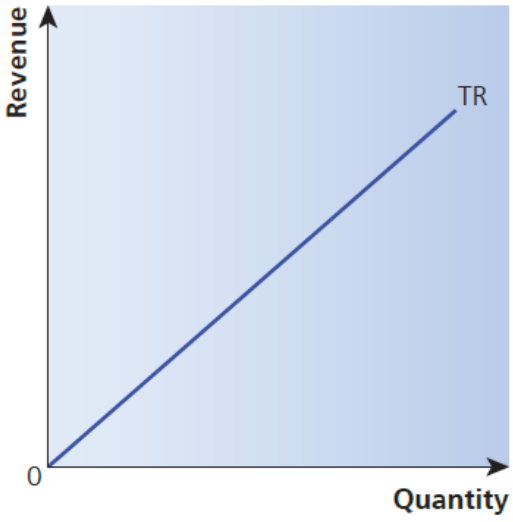
✚ If the firm is a price taker, it is operating in a very (perfectly) competitive market, and must accept the market-determined price whatever output it produces. Therefore, its TR curve will be a straight line drawn through the origin.

A price taker has to offer its product at the same price as everyone else

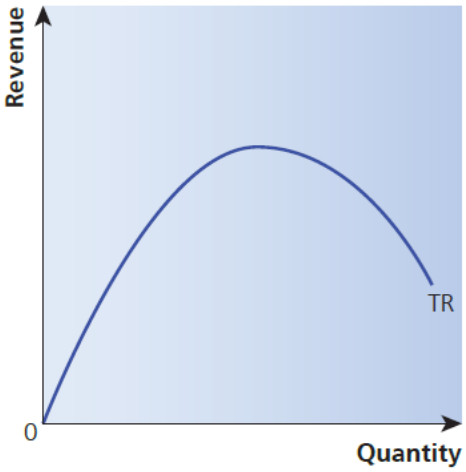
✚ If the firm is a price maker, it is operating in an imperfectly competitive market. In this case the TR curve is a parabola shape. This means that as the price falls the revenue will rise, but it rises more slowly each time that price is cut, up to the point of maximum revenue. Further price cuts will cause the TR to fall

A price maker is a firm that has sufficient market power to influence the price of the good it is selling and faces a downward sloping demand curve

<u>Total revenue curve for price taker</u>



Total revenue curve for price maker



Average revenue

Average revenue (AR) is the price the firm receives per unit sold. An AR curve is the same as the demand curve. It is calculated by dividing TR by the quantity sold:

$$AR = \frac{TR}{Q}$$

Since TR is P × Q, it can be seen that AR is the same as price:

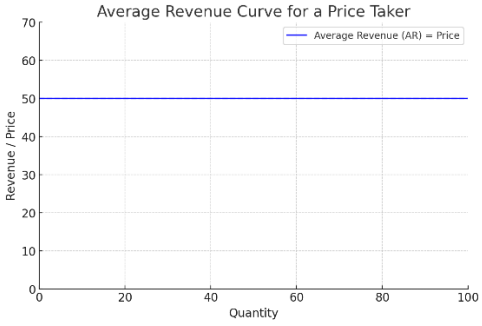
$$AR = \frac{P \times Q}{Q}$$

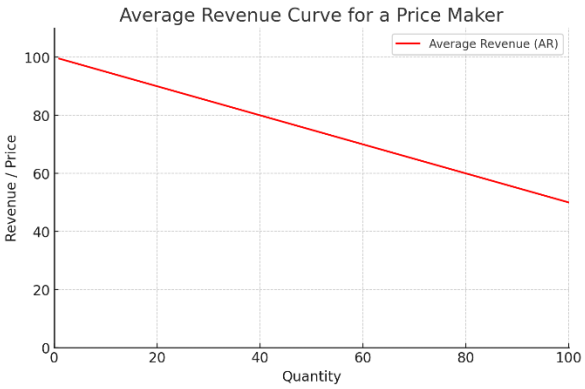
Just as with TR, the AR curve depends on whether the firm is a price taker or a price maker:

✚ A price taker faces a horizontal demand curve, which is perfectly elastic. A typical example is a fishing boat captain who brings his catch into port in the mornings. The price he gets for his fish depends entirely on the demand and supply for that type of fish at that particular port at that time, and the fisherman has to accept the price offered.

✚ A price maker faces a downward sloping demand curve.

Demand is also known as average revenue (AR).





Marginal revenue

✚ Marginal revenue (MR) is the change in total revenue from selling one more unit of output.

✚ It is calculated by dividing the change in TR by the change in the quantity sold:

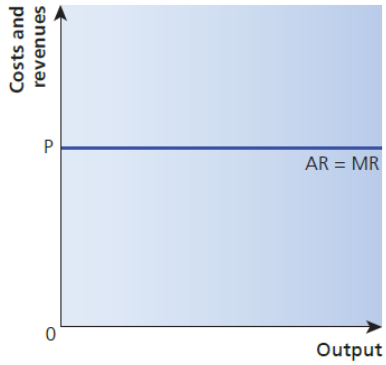
$$MR = \frac{\Delta TR}{\Delta Q}$$

✚ For a firm that is a price taker, the MR is horizontal and is equal to the AR.

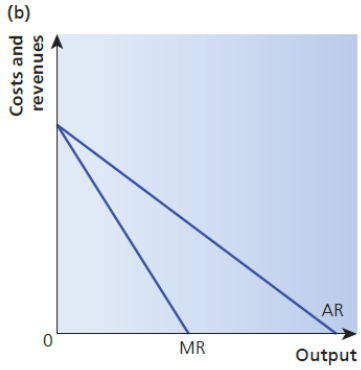
✚ For a firm that is a price maker, the MR curve is downward sloping. It has a gradient twice as steep as the AR curve. It is less than AR because cutting prices means losing money on items already sold. The reason is that when the price is reduced, the firm loses money on all the items it is already selling.

✚ A typical example might be a price-making firm on a beach selling ice creams, that has to set the price at £2 per ice cream. It finds it cannot sell very many — say 20. The total revenue is £40. It cuts the price to £1 to increase its sales and sells an extra 20 ice creams. The MR is £20 from selling 20 extra ice creams, but it loses £20 on the ice creams it could have sold at £2 each. Its TR is still £40, and its MR is zero. The only difference is that it has to sell more ice creams, which in fact costs it more, so it is actually making less profit.

<u>Marginal revenue curve for a price taker</u>



Marginal revenue curve for a price maker



Price elasticity of demand and its relationship to revenue

The formula for price elasticity of demand (PED) is:

$$\frac{\%\text{ change in quantity demanded}}{\%\text{ change in price}}$$

✚ The result is called a coefficient, meaning it is a number that goes with other numbers and does not have any units of its own.

✚ PED has a range between zero (perfectly inelastic) to minus infinity (perfectly elastic). The mid-point on a straight-line demand curve is unitary elasticity (minus one) and it is here that marginal revenue is zero (MR = 0).

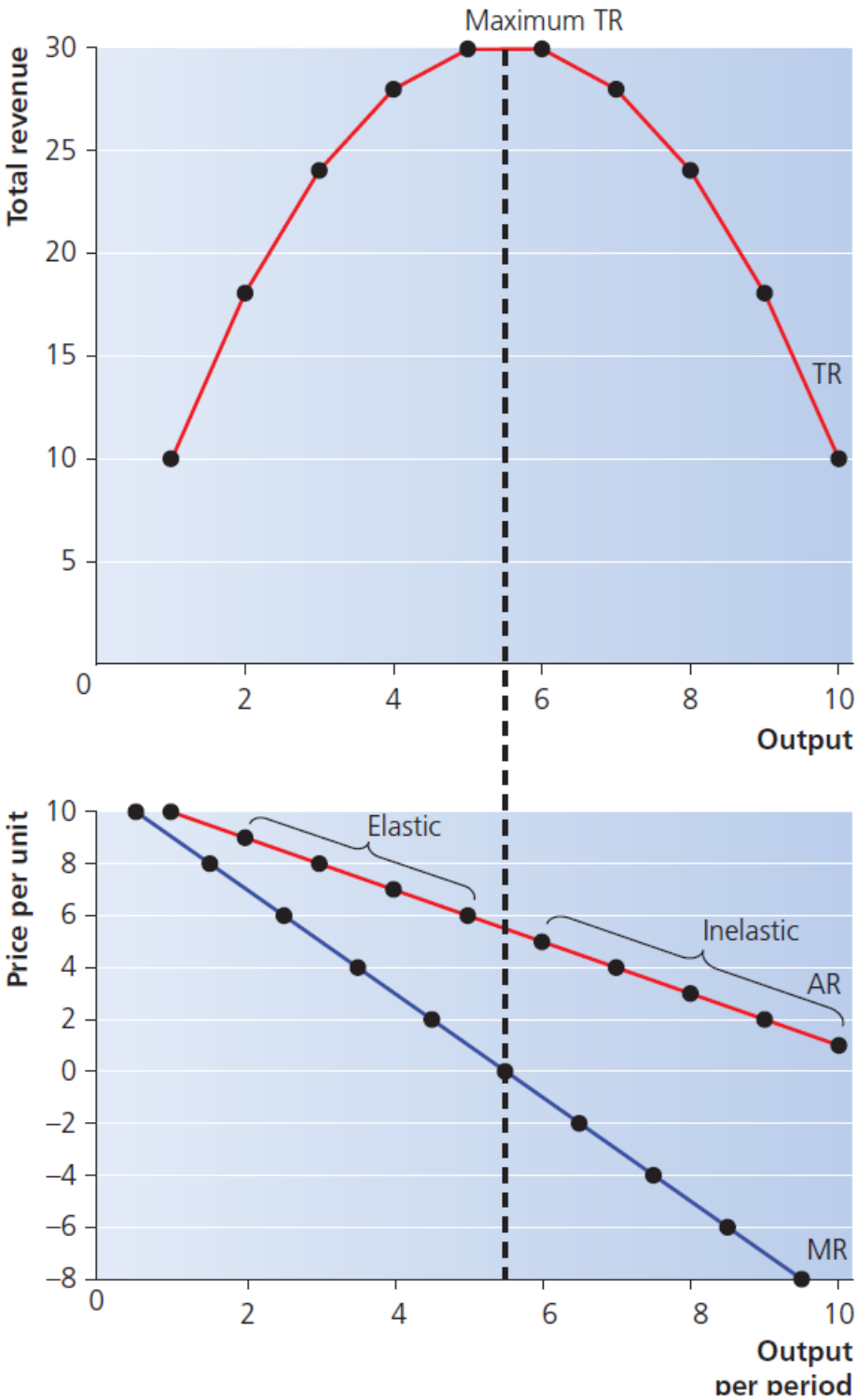
✚ However, for most firms the demand curve is downward sloping.

✚ For a price-making firm, the TR curve is a parabola shape. What this means is that as the price falls the revenue will rise, but it rises more slowly each time that price is cut, up to the point of maximum revenue.

Eventually it reaches the point where revenue will not increase any more. At that output the marginal revenue is zero, that is, MR = 0.

Relationship between TR, AR and MR

Output	Price = AR (£)	TR (£)	MR (£)	PED
0	0	—		
1	10	10	10	Elastic
2	9	18	8	Elastic
3	8	24	6	Elastic
4	7	28	4	Elastic
5	6	30	2	Elastic
6	5	30	0	Unitary
7	4	28	–2	Inelastic
8	3	24	–4	Inelastic
9	2	18	–6	Inelastic
10	1	10	–8	Inelastic



When demand is price elastic, MR is positive and TR moves in the opposite direction to the price change.

✚ When demand is price inelastic, MR is negative and TR moves in the same direction as the price change.

✚ When demand is unitary elastic, MR is zero and TR remains constant when price changes.

Chapter 5

Costs

Costs in the short run

✚ Costs are the payments that firms make for use of the factors of production. Examples include rent, wages and interest.

✚ Included in costs is a reward for risk taking, which is known as normal profit.

means that even when a firm appears to make no profit, it might still be covering all its costs, including the owner's reward for risk and time — the normal profit.

This represents the amount the risk taker must receive to keep resources in their current use. Normal profit is considered as a cost and it is built into the average cost curve

Total cost

Total cost (TC) refers to the cost of producing a given level of output.

Total costs consist of two components:

✚ Total fixed costs (TFC): these costs do not change directly with output. Examples of fixed costs include rent paid for a factory building, business rates and advertising.

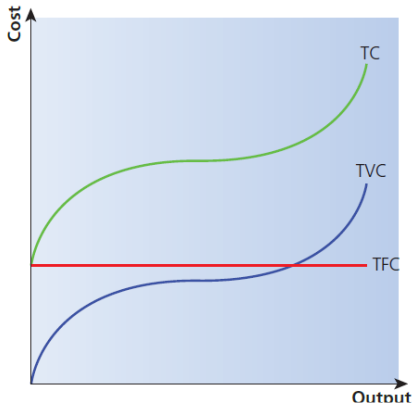
✚ Total variable costs (TVC): these vary directly with output. Examples of variable costs include raw materials such as cocoa beans used to make chocolate, wages of workers on zero-hour contracts and energy costs for a steel manufacturer.

Therefore:

TC = TFC + TVC

TFC = TC – TVC

TVC = TC – TFC



Average cost

Average cost (AC or ATC) is the cost per unit of output, i.e.:

$$AC = \frac{TC}{Q}$$

Average cost initially falls as more is produced because the fixed cost is spread out over more units of output. For example, if you are making chocolate bars, the more you produce the more the cost of the factory is spread out over the number of units produced.

Average fixed cost

Average fixed cost (AFC) is the fixed cost per unit of output.

Total fixed costs (TFC) are spread out as more is produced. Since fixed costs do not change with output, then by definition fixed cost per unit must always fall as output increases.

It is calculated by dividing total fixed cost (TFC) by the amount produced, or quantity (Q), i.e.:

$$AFC = \frac{TFC}{Q}$$

Average variable cost

Average variable cost (AVC) is the variable cost per unit of output. It is calculated by dividing total variable cost (TVC) by the amount produced, or quantity (Q),

$$AVC = \frac{TVC}{Q}$$

Marginal cost

The marginal cost (MC) is the cost to the firm of making one more unit of output.

It is calculated by dividing the change in TC by the change in output

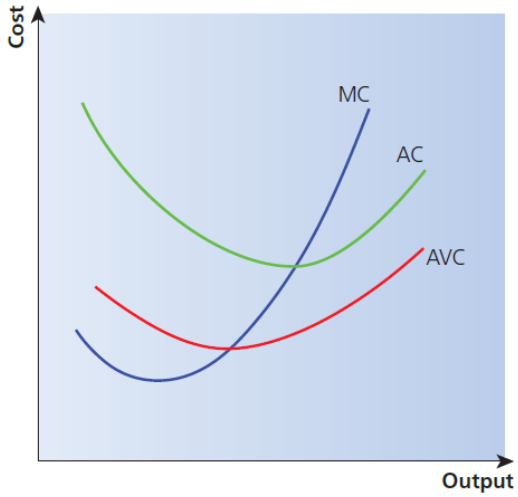
$$MC = \frac{\Delta TC}{\Delta Q}$$

The gradient of the TC curve is the MC.

The relationship between average cost and marginal cost

✚ When marginal cost is below average cost, it means the cost of producing the next unit is less than the average cost of producing a unit. Therefore, this extra unit produced brings down the AC, although the AC will not fall as much as the MC.

✚ When marginal cost is above average cost, it means the cost of producing the next unit is more than the average cost of producing a unit. Therefore, this extra unit produced causes AC to rise.



Derivation of the short-run cost curves from the assumption of diminishing marginal productivity

The law of diminishing returns

The law states that as more variable factors are added to fixed factors of production, the increase in output will eventually fall.

It is only applicable in the short run (the period of time in which at least one factor is fixed) because it assumes that at least one factor of production is fixed.

✚ To be able to picture the law of diminishing returns in your mind, imagine a farmer with an orchard of 200 apple trees.

✚ The farmer measures his marginal product in terms of baskets of apples. These increase as he hires more labourers to pick the apples.

✚ The fixed factor is the orchard; the variable factor is the workers. When an additional worker is taken on, more than double the quantity of apples may be picked because of the teamwork and cooperation involved. In other words, the marginal product increases and marginal cost falls.

✚ However, with additional workers being employed, the increase in output starts to decline, i.e. marginal product falls and marginal cost increases. This is because the apples are harder to pick as they are higher up the tree.

✚ When the employment of an additional worker causes a fall in marginal product, it is said that diminishing returns set in. It only operates in the short run, because in the long run the farmer can plant more apple trees.

Marginal product is the extra output when one more unit of the variable factor is added.

A fixed factor is a factor of production, such as the size of your apple orchard, which cannot be changed in the short run.

The law of diminishing returns and short-run cost curves

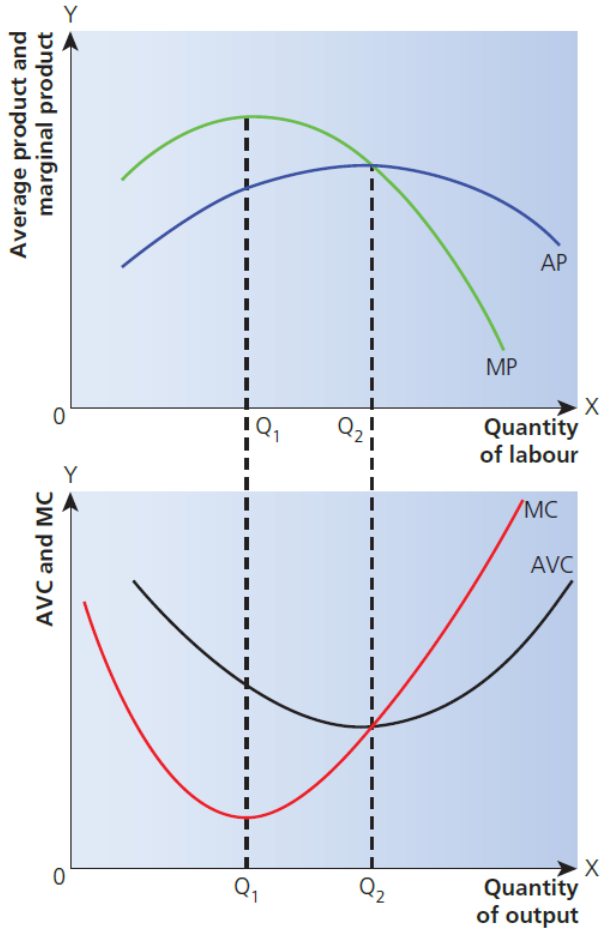
Total product (TP) is the total output of a firm in a given period of time. Average product (AP) is the unit of output produced per unit of a variable factor of production. It is calculated as follows:

$$AP = \frac{TP}{Q}$$

Marginal product is the change in output resulting from employing one more unit of the variable factor. It is calculated as follows:

$$MP = \frac{\Delta TP}{\Delta Q}$$

The relationships between AP, MP, AC and MC are illustrated in Figure. Output 0Q1 is the point of diminishing returns, i.e., the point at which the marginal product starts to fall.



The following are key relationships that can be derived from Figure

✚ When MP is rising, MC is falling and when MP is falling, MC is rising.

✚ When AP is rising, AVC is falling and when AP is falling, AVC is rising.

✚ It can, therefore, be seen that the cost curves are a mirror image of the product curves

Marginal Product (MP) and Marginal Cost (MC)

Marginal Product (MP): The additional output from employing one more unit of input (e.g., one more worker).

Marginal Cost (MC): The additional cost of producing one more unit of output.

Relationship: Inverse relationship.

When MP increases, MC decreases.

When MP decreases, MC increases.

Why? If each worker adds more output (high MP), then producing each additional unit becomes cheaper (lower MC).

Average Product (AP) and Average Cost (AC)

Average Product (AP): Output per unit of input (e.g., output per worker).

Average Cost (AC): Cost per unit of output.

Average Product (AP): Output per unit of input (e.g., output per worker).

Average Cost (AC): Cost per unit of output.

Relationship: Also inverse.

When AP is rising, AC is falling.

When AP is falling, AC is rising.

Why? - Higher productivity per input means the firm gets more output per dollar spent, reducing per-unit costs.

Total Product (TP) and Total Cost (TC)

Total Product (TP): Total quantity of output produced.

Total Cost (TC): Total cost of production (fixed + variable).

Relationship: As TP increases, TC also increases, but the rate depends on how efficiently inputs are used.

In the increasing returns phase, TP rises quickly → TC rises slowly.

In diminishing returns, TP rises slowly → TC rises faster.

Key insight: When TP grows fast → cost per unit falls.

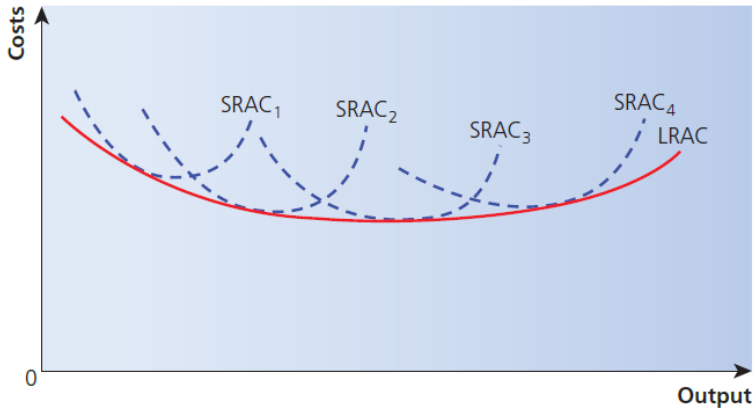
When TP grows slow → cost per unit rises.

The relationship between short-run and long-run average cost curves

✚ In the short run there are some fixed factors of production so, as explained above, the short-run average costs are determined by the law of diminishing returns.

✚ In the long run, however, all resources are variable, enabling new, larger production facilities to be built. The long-run average cost (LRAC) curve is derived by drawing it at a tangent to the short-run average cost (SRAC) curves SRAC1, SRAC2, SRAC3 and SRAC4. This is illustrated in Figure.

✚ Therefore, a long-run average cost will show what the long-run cost of producing each output will be.



Chapter 6

Economies and diseconomies of scale

Economies of scale occur when an increase in the scale of production results in a more than proportionate increase in output, so causing a fall in long-run average costs.

✚ Economies of scale, therefore, are a long-run concept, since a change in the scale of production implies that all resources are variable.

✚ When a firm is experiencing economies of scale, long-run average costs fall as output increases.

✚ Internal economies of scale arise when a firm grows larger and it benefits from lower long-run average costs (see below). **Internal economies of scale occur when the long-run average costs of production decrease as a firm increases in size**

✚ External economies of scale arise when a whole industry grows larger and firms in that industry benefit from lower long-run average costs. **External economies of scale occur when the long-run average costs of production decrease for firms as the whole industry increases in size.**

Examples of internal economies of scale

The following are examples of internal economies of scale:

✚ Technical economies: doubling the dimensions of any object increases the volume by eight times. Therefore, a larger warehouse, or a larger shop can hold much more per square metre.

✚ Marketing economies: as a firm grows bigger, the cost of advertising is spread out over a larger number of potential customers. For example, a national advert would not be suitable for a small or regionally based firm.

✚ Commercial economies: large firms can bulk-buy from their suppliers. Because they buy a large amount at a steady rate, they are likely to get better deals. For example, Walmart pays a very low price to its suppliers and that is how it keeps prices low.

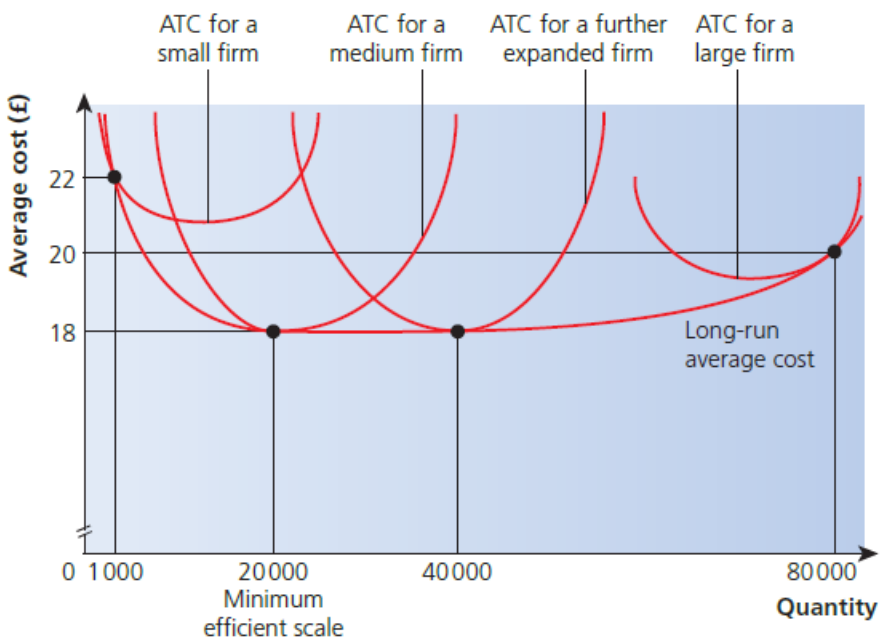
✚ Managerial economies: larger firms can increase efficiency by employing highly skilled and more experienced managers, who specialise in managing particular parts of the business.

✚ Financial economies: large firms can issue shares on the stock market and can-do deals with lenders to borrow at a lower rate of interest. Since they have more collateral, large firms are regarded as a lower risk than small firms because they hold more assets that can be sold to pay off a debt.

✚ Risk-bearing economies: large firms can spread risks by diversification. They can sell a wider range of goods or sell in a wider range of markets, e.g. by selling in different countries.

Minimum efficient scale

The minimum efficient scale (MES) is the output at which a firm's long-run average cost curve stops falling. Or it can be viewed as the minimum output at which internal economies of scale are fully exploited



Explanation in Steps

Long-Run Average Cost (LRAC):

Shows the lowest possible cost per unit when all inputs are variable.

Initially, as a firm increases output, it benefits from economies of scale (costs per unit fall).

Minimum Point:

This is where the LRAC is lowest.

In the graph, this is around 20,000 units, called the Minimum Efficient Scale (MES).

Constant Returns to Scale:

After reaching MES, the LRAC may stay flat for a range of output.

This flat section indicates constant returns to scale:

- Output increases.
- Average cost stays the same.

In this range, the firm is producing more, but not getting cheaper or more expensive per unit.

Before LRAC Rises:

Eventually, as the firm gets even larger, diseconomies of scale may kick in (due to management complexity, inefficiencies, etc.).

This causes the LRAC to rise — that's the upward slope after the flat part.

Diseconomies of scale

Diseconomies of scale occur when long-run average costs increase as output increases. There are various sources of diseconomies of scale:

✚ X-inefficiency: As a firm increases in size, administration costs may increase disproportionately. Further, a lack of competition for a large firm may mean that costs are allowed to rise.

✚ Poor communication: the lines of communication between managers and workers may become complex. As a result, workers may experience delays in getting the information they require at an appropriate time.

✚ Demotivation: large businesses tend to be impersonal and workers may not feel valued. This could result in an increase in absenteeism or employees not working efficiently. Consequently, productivity is likely to decrease.

✚ Poor co-ordination: large firms can become difficult to manage, especially if they are operating in different countries with different cultures, time zones, languages and hours of working. Coordinating production decisions across a large organisation can be very difficult, with the result that productivity may fall and average costs increase.

External economies of scale

External economies of scale arise when a whole industry grows larger and firms in that industry benefit from lower long-run average costs.

✚ External economies of scale cause the LRAC curve of the firm to move downwards without any action by the firm itself as the industry grows.

✚ External economies of scale are an example of the external benefits of production that arise when an industry grows in size.

Types of external economies of scale

✚ Improvements in transport that benefit all firms in a particular industry.

✚ Skilled labour may be attracted to an area that gets a reputation for specialising in a particular service, e.g. Tech City in East London attracts those with IT skills. This reduces training and recruitment costs for all firms in that industry.

✚ New methods of production, e.g., in the hospitality industry, iRobot Roomba is a machine that can do vacuum cleaning by itself, so benefiting hotel chains.

✚ Firms based in Tech City in East London are benefiting from super-fast broadband, new transport links and excellent publicity from the government, which make it cheaper and more effective for any firm that is based there.

External diseconomies of scale

As the industry grows, external diseconomies of scale may set in. External diseconomies of scale would cause the LRAC curve of the firm to move

upwards without any action by the firm itself as the industry grows.

Types of external diseconomies of scale

✚ There might be higher costs, e.g., rents on offices, if many firms want to locate in a particular region.

✚ Congestion could occur if an industry located in a particular area grows rapidly. This would increase the costs of transporting raw materials and finished goods.

✚ As the industry grows, demand for resources needed by that industry increases. Consequently, any one firm in the industry will face higher unit costs for resources such as labour, raw materials and machinery.

Chapter 7

Profits and losses

Profit is the reward for risk taking. It is the difference between revenue and costs.

Profit maximisation

✚ Profit maximisation occurs where the firm cannot increase its profits, whether by increasing or decreasing price or output.

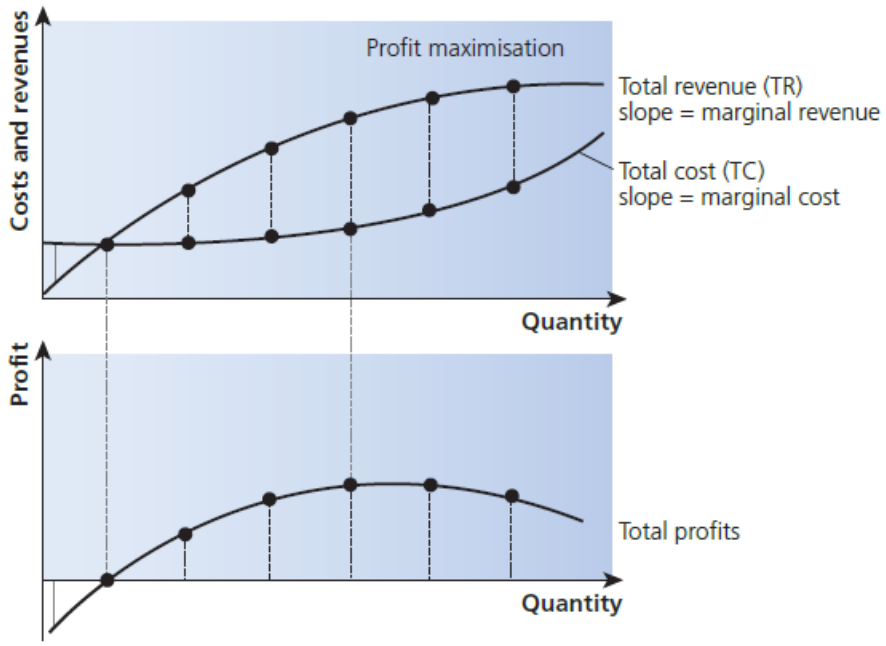
✚ It is best explained using marginal analysis. For this, you must first understand the key terms marginal cost (MC), marginal revenue (MR) and marginal profit (MP).

✚ The profit maximisation point is MR = MC. In other words, the output at which profit maximisation occurs is that at which the cost of making one more unit is exactly equal to the revenue gained from selling that unit.

✚ This formula (MC = MR) can be rearranged to give marginal profit: MR − MC = 0. Therefore, profits are maximised when marginal profit is zero.

✚ Another way of looking at profit maximisation is the output at which the difference between TR and TC is greatest.

✚ When MR = MC, the gradients of the TC and the TR curves are the same. Because these are concave to each other this must also be the point at which they are furthest apart. This can be illustrated as follows.



✚ Consider the situation if a firm produced at a different output than MC = MR. At a lower output, MR is greater than MC. There is more profit to be made by increasing output.

✚ Likewise, consider the situation if a firm is producing at an output higher than MR = MC, i.e. when MC > MR. The cost of making another unit is more than the revenue received from selling it. Therefore, if the firm reduces production, it would increase its profit.

Normal profit, supernormal profit and losses

Normal profit

✚ This is the minimum necessary to keep the risk-taking resources in their current use. Therefore, it represents an opportunity cost.

✚ It is built into the AC curve, and represents the cost of use of the entrepreneurship factor of production.

✚ Normal profit occurs when AC = AR or TC = TR.

✚ It does not act as a signal for other firms to enter the market, nor does it cause firms to want to leave the market.

✚ The size of normal profit varies according to the level of risk involved, and the other investment opportunities available at the time. A business 'upcycling' furniture probably does not need much profit to stay in that line of business — just enough to prevent the owner finding a job working for someone else. But for an oil exploration firm with a 20-year investment cycle, normal profits will need to be much higher, because the risks are much greater.

Supernormal profit

✚ This is profit above the minimum required to stay in business.

✚ It is the difference between TR and TC or between AR and AC.

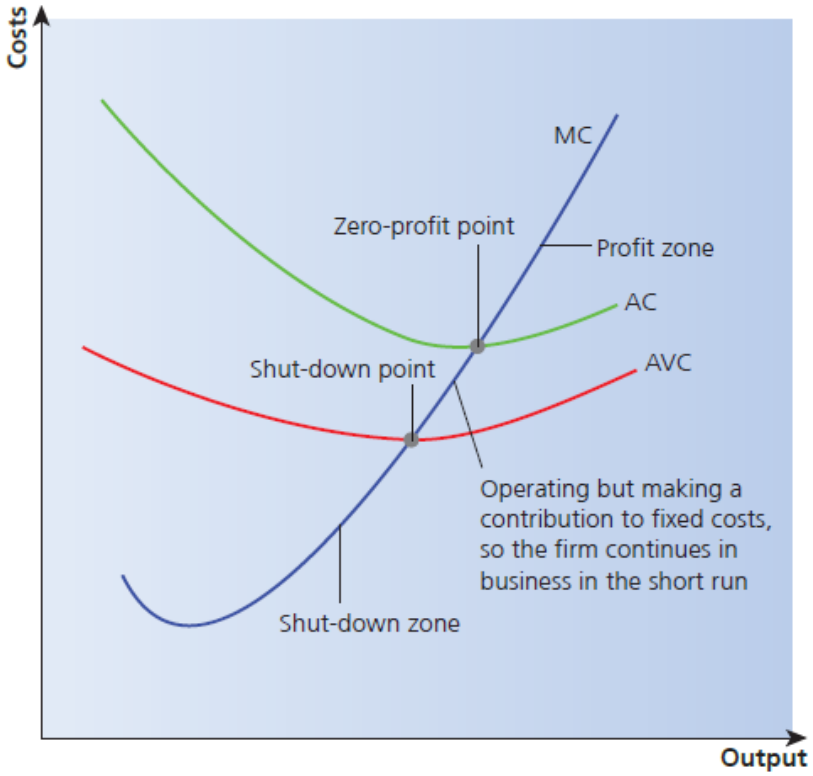
Loss

✚ A loss occurs when a firm's total costs exceed revenues, TC > TR, or the average cost of production is greater than the price per unit.

✚ The break-even level of output occurs when TC = TR, and/or AC = AR. The firm will stay in business here because it is earning normal profit.

✚ However, a firm does not automatically shut down when making a loss. If a firm is covering its average variable costs it will stay in business in the short run. Therefore, the point where P = AVC, and any price below that, is the point at which it will shut down. This point is often referred to as the shut-down point

The shut-down point is where price is equal to average variable cost (AVC). If AVC is not covered then the firm will close down in the short run



Shut-down Point

Where Price = AVC (i.e., Marginal Revenue = AVC).

If the market price falls below AVC, the firm cannot cover variable costs.

Firm should shut down immediately in the short run.

Operating but Not Profitable

If the price is between AVC and AC, the firm covers all variable costs and some fixed costs.

The firm makes a loss, but it's less than shutting down, so it stays open in the short run.

Zero-Profit Point (Normal profit)

Where Price = AC.

The firm covers all costs (including fixed costs) but earns zero economic profit.

This is also known as the break-even point.

Profit Zone

When Price > AC, the firm earns a positive economic profit.